



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

[Advanced manufacturing \(1\)](#)

[Advanced materials \(5\)](#)

[Autonomous systems & robotics \(2\)](#)

[Breakthrough technology \(3\)](#)

[Communications technology \(1\)](#)

[Cyber security \(1\)](#)

[Energy \(3\)](#)

[Government S&T \(2\)](#)

[Imaging technology \(2\)](#)

[Information technology \(2\)](#)

[Materials science \(4\)](#)

[Neuroscience \(2\)](#)

[Quantum science \(1\)](#)

[Science without borders \(1\)](#)

[Sensors \(1\)](#)

[STEM \(1\)](#)

FEATURE ARTICLES

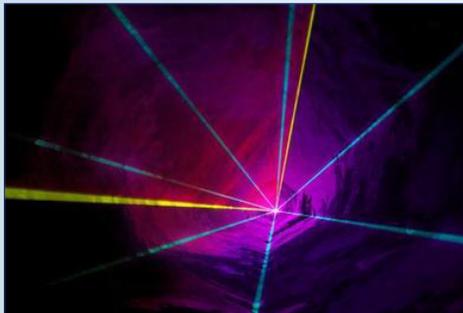
[No assembly required for new micro particles](#)

[Futurity.org, 06NOV2012](#)

Scientists at New York University have created new kinds of particles—1/100th the diameter of a human hair—that “self-assemble” into structures that look like molecules made from atoms. These new particles come together to form structures in patterns that were previously impossible to make and hold promise for manufacturing advanced optical materials and ceramics. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Featured Article

[Laser the size of a virus particle: Miniature laser operates at room temperature and defies the diffraction limit of light](#)



Laser light show. Lasers developed on a much smaller scale—plasmonic nanolasers—could be integrated into silicon-based photonic devices, all-optical circuits and nanoscale biosensors. (Credit: © Digishooter / Fotolia)

structures with a 3-D ‘bowtie’ shape.” These metal nanostructures support localized surface plasmons that have no fundamental size limits when it comes to confining light. Plasmonic nanolasers could be readily integrated into silicon-based photonic devices, all-optical circuits and nanoscale biosensors. [TECHNICAL ARTICLE](#)

Tags: Materials science, Featured Article

[Particle and wave-like behavior of light measured simultaneously](#)

[Science Daily, 04NOV2012](#)

Researchers in England have devised a novel type of measurement apparatus that can measure both particle and wave-like behaviour simultaneously. The new device is powered by quantum nonlocality, another strikingly counter-intuitive quantum effect. The measurement apparatus detected strong nonlocality, which certified that the photon behaved simultaneously as a wave and a particle in their experiment. This represents a strong refutation of models in which the photon is either a wave or a particle. [TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, Materials science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Making Value: Integrating Manufacturing, Design, and Innovation to Thrive in the Changing Global Economy](#)

[National Academies, 06NOV2012](#)

Manufacturing is in a period of dramatic transformation. But in the United States, public and political dialogue is simplistically focused almost entirely on the movement of certain manufacturing jobs overseas to low-wage countries. The true picture is much more complicated.

Tags: Advanced manufacturing

ADVANCED MATERIALS

[Revolutionary type of gel discovered](#)

[Science Daily, 05NOV2012](#)

Researchers in Switzerland have developed a method to combine two gels in such a way that they can monitor and change, almost at will, the properties of the new combined material. They consist of a network of solids that can retain up to 99% of liquid while maintaining their shape.

continued...

[BACK TO TOP](#)

Their discovery marks an important step for materials used in healthcare, high-tech, and the cosmetics industry.

TECHNICAL ARTICLE

Tags: Advanced materials

A new order in the quantum world

[Nanowerk, 04NOV2012](#)

Researchers in Germany have shown that under the influence of laser beams single atoms of carbon would arrange into clear geometrical structures. But in contrast to classical crystals all possible configurations would exist at the same time, similar to the situation of Schrödinger's cat which is in a superposition state of both "dead" and "alive". The observation was made after transferring the particles to a highly excited Rydberg-state. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

Materials scientists make additive-free battery electrodes with nanoparticles

[Science Daily, 04NOV2012](#)

The critical processing technique used by researchers at Cornell University was electrophoretic deposition, which binds the metal nanoparticles to the surface of the electrode substrate to each other in an assembly, creating strong electrical contacts between the particles and current collector. Once attached, the particles are no longer soluble and are mechanically robust. The process results in a significant improvement in battery electrode assembly that cannot be replicated by conventional methods. TECHNICAL ARTICLE

Tags: Advanced materials

To rid water of salt, researchers tap graphene and computing

[Nanowerk, 04NOV2012](#)

The goal of MIT researchers is to drill just-the-right-width, billionth-of-a-meter nanopores into graphene's normally impenetrable surface so pressurized water alone could get through without damaging the ultrathin structure. That might make it more efficient than the reverse osmosis process that offers the best performance of all seawater desalination options. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Algorithms Allow MAVs to Avoid Obstacles with Single Camera and Neuromorphic Hardware (w/video)

[IEEE Spectrum, 06NOV2012](#)

The new algorithm works by taking a single still frame from a camera stream and classifying the image into areas that are safe for the robot to pass through, and areas that aren't. To do this quickly and efficiently, the researchers are running their algorithm on a neuromorphic hardware platform based on the collective firing of a network of

artificial neurons. Obstacles are separated out from backgrounds using a series of taught visual cues.

Tags: Autonomous systems & robotics

Video Friday: Tigtropes, Missiles, and Isaac Asimov

[IEEE Spectrum, 04NOV2012](#)

Isaac Asimov lays down the Laws in this week's robot Video Friday.

Tags: Autonomous systems & robotics

BREAKTHROUGH TECHNOLOGY

Scientists build the first all-carbon solar cell

[Science Daily, 04NOV2012](#)

Unlike rigid silicon solar panels that adorn many rooftops, Stanford's thin film prototype is made of carbon materials that can be coated from solution. Perhaps in the future we can look at alternative markets where flexible carbon solar cells are coated on the surface of buildings, on windows or on cars to generate electricity. TECHNICAL ARTICLE

Tags: Breakthrough technology, Energy, Solar energy

Synthetic magnetism used to control light: Opens door to nanoscale applications that use light instead of electricity

[Science Daily, 04NOV2012](#)

Lacking electrical charge photons are free to run even in the most intense magnetic fields. But Stanford University researchers have created a device that tames the flow of photons with synthetic magnetism. The process breaks a key law of physics known as the time-reversal symmetry of light and could yield an entirely new class of devices that use light instead of electricity for applications ranging from accelerators and microscopes to speedier on-chip communications. TECHNICAL ARTICLE

Tags: Breakthrough technology

COMMUNICATIONS TECHNOLOGY

2,000 Times Faster Broadband Aim

[BBC News, 06NOV2012](#)

The process used by researchers in England takes raw digital data, converts it to a series of physical electrical waves, and then into an optical signal that a laser can pump down a cable. The breakthrough is that the team has managed to design the electronic kit that can both code and decode these optical signals on the fly.

Tags: Communications Technology, S&T UK

CYBER SECURITY

Anti-counterfeiting with DNA nanotechnology

[Nanowerk Spotlight, 06NOV2012](#)

The DNA molecules are added to a product's raw material during the production process. Only 1 ppm (one part per million) is required to uniquely mark the material. The DNA

continued...

“True Science teaches, above all, to doubt, and to be ignorant.”

MIGUEL DE UNAMUNO

molecular structure can then be read as a mathematical code based on the four DNA molecules. So a DNA code, in contrast to the binary code used in IT security, is a combination of the letters A, C, G and T. A 10-digit code could look like this: C-G-A-C-T-T-G-A-C-A.

Tags: Cyber security

ENERGY

A temporary storage for electrons

[Nanowerk, 04NOV2012](#)

Scientists in Germany have found that the environment of the catalytic site on hydrogen-producing enzyme acts as an electron reservoir. Thus, it can very efficiently produce hydrogen, which has great potential as a renewable energy source. [TECHNICAL ARTICLE](#)

Tags: Energy, S&T Germany

Chinese Research Developed New Nano Lithium Titanate Material

[China NOST News, 04NOV2012](#)

Using a combination of solid-phase synthesis techniques and carbon-coating technology researchers in China have developed new nano lithium titanate material of high electronic conductivity. The new lithium-ion battery can be used for storage of large scale energy from, for example, solar and wind.

Tags: Energy, S&T China

New silicon-based batteries outperform current batteries: ‘Crushed’ porous silicon anodes show dramatic increase in charge-discharge cycles

[Science Daily, 04NOV2012](#)

Rice University researchers have created a silicon-based anode that easily achieves 600 charge-discharge cycles at 1,000 milliamp hours per gram (mAh/g). This is a significant improvement over the 350 mAh/g capacity of current graphite anodes.

Tags: Energy

GOVERNMENT S&T

Night or Day, Rain or Shine: DARPA Seeks Multi-Band, Portable Sensor to Provide Clear Imagery to Warfighters

[DARPA News, 05NOV2012](#)

DARPA created Pixel Network for Dynamic Visualization program, or PIXNET, which aims to develop helmet-mounted and clip-on camera systems that combine visible, near infrared, and infrared sensors into one system and aggregate the outputs. PIXNET technology would ingest the

most useful data points from each component sensor and fuse them into a common, information-rich image that can be viewed on the warfighter’s heads-up display, and potentially be shared across units.

Tags: Government S&T, DARPA, Information technology

Navy researchers look to rotating detonation engines to power the future

[Science Daily, 04NOV2012](#)

At the U.S. Naval Research Laboratory, scientists are studying the complex physics of rotating detonation engines which offer the potential for high dollar savings by way of reduced fuel consumption in gas-turbine engines.

Tags: Government S&T

IMAGING TECHNOLOGY

Room-temperature mid-infrared single-photon spectral imaging

[Nature Photonics, 06NOV2012](#)

A room-temperature dark noise of 0.2 photons/spatial element/second is measured, which is a billion times below the dark noise level of cryogenically cooled InSb cameras. Single-photon imaging and a resolution of up to 200 × 100 spatial elements are obtained with a record-high continuous-wave quantum efficiency of ~20% for polarized incoherent light at 3 μm. The proposed method is relevant for existing and new mid-infrared applications such as gas analysis and medical diagnostics.

Tags: Imaging technology

China’s Newest Stealth Fighter Takes Flight

[Wired Danger Room, 04NOV2012](#)

China’s newest stealth fighter prototype reportedly took off on its first test flight over the Shenyang Aircraft Company airfield in northeastern China on Wednesday morning. The 10-minute aerial debut of the twin-engine Falcon Eagle represents a huge leap forward for China’s ambitious stealth warplane program.

Tags: Imaging technology, Military technology, S&T China

INFORMATION TECHNOLOGY

A Paper-Like Display Showing Color Video

[MIT Technology Review, 06NOV2012](#)

The display is a paper-like LCD that can show video. On top of that, the display is low-power, relatively speaking. The results could be of great use to device makers who want to simulate a paper-like experience while adding the capabilities of color video. [VIDEO](#)

Tags: Information Technology

continued...

Looking for information?**Fraunhofer Research Institute, 31OCT2012**

Putting on a pair of novel data glasses with an OLED microdisplay allows you to see not only the real world, but also a wealth of virtual information. Imagine looking through a repair manual; the trick here is that you turn the pages using just your eyes.

Tags: Information Technology

FEATURED RESOURCE**Scientific Reference Linking System (SREF)**

Provides links to the publications of participating publishers. Users can search journals from 1980-present and compile bibliographies in desired format.

MATERIALS SCIENCE**A step toward stronger polymers****Nanowerk, 06NOV2012**

If your material properties depend on having polymers connected to each other to form a network, but you have polymers folded around and connected to themselves, then those polymers are not part of the network. They weaken it. Researchers at MIT have developed, for the first time, a way to measure how many loops are present in a given polymer network, an advance they believe is the first step toward creating better materials that don't contain those weak spots.

Tags: Materials science, Breakthrough technology

New two-dimensional semiconductor has ideal band gap for solar harvesting**PhysOrg.com, 06NOV2012**

Materials scientists at the University of California, Berkeley, have synthesized and characterized a new semiconductor material that consists of an atomically thin (0.7-nm) layer of selenium and molybdenum that has an ideal band gap for solar harvesting and optoelectronics applications, and also exhibits some unique behavior. **TECHNICAL ARTICLE**

Tags: Materials science, Semiconductors

China's cold-resistant subway train ready for service**China NOST News, 05NOV2012**

The train, which features cold-resistant materials and inert gases in its design, can operate in temperatures as low as minus 38 degrees Celsius. It is expected to be put into operation in northeast China's city of Harbin by the end of the year.

Tags: Materials science, S&T China

NEUROSCIENCE**Brain May 'See' More Than the Eyes, Study Indicates****Newswise, 04NOV2012**

According to University of Virginia researchers vision may be less important to "seeing" than is the brain's ability to process points of light into complex images. In their experiments they found that the simple eyes of fruit fly larvae provide just enough visual input to allow the animal's relatively large brain to assemble images.

Tags: Neuroscience

In-sync brain waves hold memory of objects just seen**Science Daily, 04NOV2012**

The brain holds in mind what has just been seen by synchronizing brain waves in a working memory circuit. The more in-sync such electrical signals of neurons were in two key hubs of the circuit, the more those cells held the short-term memory of a just-seen object. The work demonstrates, for the first time, that there is information about short term memories reflected in in-sync brainwaves.

TECHNICAL ARTICLE

Tags: Neuroscience

QUANTUM SCIENCE**World record for entanglement of twisted light quanta****Science Daily, 04NOV2012**

Researchers in Vienna developed a new method for entangling single photons which gyrate in opposite directions. This result is a first step towards entangling and twisting even macroscopic, spatially separated objects in two different directions. **TECHNICAL ARTICLE**

Tags: Quantum science, Breakthrough technology

SCIENCE WITHOUT BORDERS**Theory of everything says universe is a transformer****New Scientist, 06NOV2012**

It has been suggested that the Theory of Everything could account for several fundamental mysteries, such as why time flows in only one direction. Physicist David Deutsch, a pioneer in quantum computation at the University of Oxford, has posted a taste of the form his theory might take, opening the door to what may become a new branch of physics.

Tags: Science without borders

SENSORS

Sensors for the real world

R&D Magazine, 06NOV2012

Over the last decade there has been an increased interest in developing resonators for gravimetric sensing; however, the sensors' response to variations in temperature has prevented them from being used outside the laboratory. New sensors developed by researchers at the University of Cambridge negate the effects of temperature so that they may be used in industries including health care, telecommunications, and environmental monitoring.

Tags: Sensors

STEM

Build a Coffee-Can Radar (w/video)

IEEE Spectrum, 04NOV2012

Researchers at MIT's Lincoln Laboratory devised a radar system that any avid DIYer should have no trouble reproducing. This simple radar system provides a basis for courses being taught at MIT and elsewhere. It is capable not only of measuring velocities but also of finding the range to targets. You can even make crude synthetic-aperture radar images with it.

Tags: STEM ■

ABOUT THIS PUBLICATION

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To subscribe (or unsubscribe), visit <https://tin-ly.sainc.com/ASDRE>. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com.

This publication is authored and distributed by:

Dr. Melissa Flagg

Director, Office of
Technical Intelligence (OTI)

Ms. Hema Viswanath

OTI Corporate Librarian